Math 1172 HW #9

Section 11.2 # 23, 56
11.3 # 13, 23

11.2 #23 $3 - 4 + \frac{16}{3} - \frac{64}{9} + \dots$

$a = 3$
$r = -\frac{4}{3}$ $\quad |r| > 1$ so it diverges

$\left(\frac{1}{3}\right)^{-3}$

11.2 #56 $10.1\overline{35} = 10.1 + .035\overline{35}$

$\frac{35}{1000} + \frac{35}{10000} + \dots \qquad a = \frac{35}{1000}$

$r = \frac{35}{10000} \cdot \frac{1000}{35} = \frac{1}{100}$

Converges to

$.0\overline{35} = \frac{a}{1-r} = \frac{\frac{35}{1000}}{1 - \frac{1}{100}} = \frac{35}{990}$

So $10.1\overline{35} = 10.1 + \frac{35}{990}$

$= \frac{101}{10} + \frac{35}{990} = \frac{10037}{990}$

11.3 #13 $1 + \frac{1}{8} + \frac{1}{27} + \dots = \sum_{n=1}^{\infty} \frac{1}{n^3}$

$$\int_1^{\infty} \frac{1}{x^3}\,dx = \lim_{t\to\infty} \int_1^t x^{-3}\,dx = \lim_{t\to\infty} \frac{1}{-2} x^{-2} \Big|_1^t$$

$$= \lim_{t\to\infty} \frac{-1}{2} t^{-2} - \frac{-1}{2} \cdot 1^{-2} = \frac{1}{2}$$ Converges

So the series converges

11.3 #23 $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

$$\int_2^{\infty} \frac{1}{x \ln x} = \lim_{t \to \infty} \int_2^t \frac{1}{x \ln x} dx \qquad u = \ln x \quad du = \frac{1}{x} dx$$

$$= \lim_{t \to \infty} \int \frac{1}{u} du = \lim_{t \to \infty} \ln|u| = \lim_{t \to \infty} \ln|\ln x| \Big|_2^t$$

$$= \lim_{t \to \infty} \ln|\ln t| - \ln|\ln 2|$$

$\ln \infty$ diverges

So the series diverges